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MAINE AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 23.

SECOND SERIES.

PRESERVATION OF CREAM FOR MARKET.

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It is an important feature of our dairy business that there is a growing demand for fresh sweet cream, not only for domestic use, but for exporting to the large cities. During the past year this cream trade from Maine has considerably exceeded \$150,000 and each year finds the demand increasing. It has come to be an important question how best to foster this branch of our dairy business, and during that season when butter is most abundant and cheapest—for there is the greatest demand for cream during the summer months—to find a profitable market for this commodity and so reduce the butter supply and at the same time increase the profit from the dairy. One important reason for fostering the cream trade is that cream sold to be consumed as cream is in no large degree a rival of either milk or butter, but enlarges the demand for dairy products at a time when such products are most abundant and most cheaply produced.

The only obstacle in the way of this trade that has retarded its development is the perishable nature of cream. While it is but little more perishable than milk, it is in a sense a manufactured product and subject to delays in the process of manufacture before it can find its way to market. This difficulty is in a measure overcome by the perfecting of cream separators which quickly condenses the cream from the milk without any long delay or opportunity for change, or by what is often found to be a more practical way, the cream obtained from the milk by the deep cold setting process is condensed by the separator while it is yet sweet and comparatively fresh.

One reason why there has been more risk in handling cream than milk is the greater value of the cream, involving greater loss when it fails to reach the market in good condition.

As is very generally known at the present time, souring the cream is due to the growth of minute organisms or plants called bacteria. These bacteria are not present in the milk while it is

yet in the udder of the cow, but they are so universally distributed, especially in warm weather, about the barns and in the dust of the air, that the milk has scarcely reached the pail on its way from the udder of the cow before it is contaminated with them. Under favorable conditions for their growth they will cause the milk or cream separated from it to sour and no ordinary straining or even passing the milk through a cream separator will remove them. After the bacteria that cause souring of milk and cream are once introduced, they will multiply rapidly and soon do their work unless they are destroyed or held in check, that is, their growth and multiplying prevented.

METHODS OF DESTROYING THE GERMS.

There seem to be but three methods of preventing this growth and consequent souring of the cream: First, by means of cold; second, addition to the milk or cream of some germicide like boric or salicylic acid; or third, by subjecting the cream to a sufficiently high temperature to destroy the germs. Each of these methods has its advantages and disadvantages when put to practical use, and it is the purpose of this bulletin to show which of them has the most to recommend it.

USE OF COLD.

In this climate during steady cold weather there can be but little objection to the use of cold as a preservative in shipping cream to local markets. Cream that is kept at a temperature below 45 F. will remain sweet for a long time, but in warm weather and when it has to be shipped to a distant point in warm cars, the necessary cold is secured by the use of ice, which is an unsatisfactory method on account of expense, although the quality of the cream brought to market by this method is of the highest.

USE OF GERMICIDES.

The method of adding something to the cream that will destroy the bacteria or prevent their growth, no matter how warm the weather or how distant the market, appeals to the dealer on account of its cheapness, simplicity and effectiveness. Cream in which a sufficient quantity of boric acid or salicylic acid has been introduced, for these are the substances generally used as preservatives of cream, will remain perfectly sweet for an indefinite time even in the hottest summer temperature. These chemicals produce no decided change in the taste or appearance of the cream, and it is no wonder that this method has sometimes been adopted

by those who have seen in it a solution of the only difficulty in the way of extending a lucrative cream trade. What, then, are the objections to this method? The first and the very decided objection that will occur to the consumer is, that when paying for sweet and wholesome cream he does not want it diluted with anything else. In view of the comparatively small quantity of the preservative that has to be used, this objection might be overcome by an appeal to the reason of the consumer, if he did not have reason as well as prejudice on his side. If it could be shown that the preservative was as harmless as the cream itself there would, perhaps, be no reasonable objection to it, but the best that can be claimed for these chemical preservatives is, that while they are sure death to bacteria they only endanger the health and derange the digestive apparatus of human beings. Among those qualified to judge of the effect of these substances when taken into the stomach of human beings, there is practically but one opinion, and that is, that the constant consumption of them is only harmful even if taken in small quantities. In certain cases where persons are suffering from disease of the digestive organisms, the use of cream preserved by this method is positively dangerous.

The statement is made by Foraster and quoted in the National Dispensatory that boric acid greatly increases the faecal solids and the excretion of albuminous compounds even when given in a daily dose of seven or eight grains, and that these effects continue for some time after the suppression of the medicine.

The United States dispensary says that the practice of using salicylic acid for a preservative of articles of food is to be condemned. A commission appointed by the French government reported that the prolonged use of even a very small amount of salicylic acid is dangerous, especially to very aged persons.

It is not difficult to see that it will be fatal to the permanent interests of the cream trade if dependence is placed upon chemical preservatives to keep the cream sweet. Such a practice is quite easily detected by chemical tests and a well founded suspicion that it is commonly resorted to can only work injury to the trade, even in cream preserved by unobjectionable methods.

USE OF HEAT.—PASTEURIZATION.

The third method for keeping cream sweet until it reaches the consumer, namely, by the use of heat, is based upon the fact that bacteria that cause souring of cream are destroyed at a tempera-

ture which leaves the cream uninjured. By practical tests it has been found that a temperature of 155 deg. F. continued for ten minutes will destroy nearly all of the souring organisms without seriously injuring the appearance and without perceptibly affecting the taste or wholesomeness of the cream. This method is termed "pasteurization." While pasteurization may not destroy all bacteria that are sometimes found in cream, so that there is no possibility that souring will take place afterwards, it does destroy most of them, and if cream so treated is at once placed in sterilized cans with proper precautions to guard against introducing any more germs, it has been found in practice that it can be shipped to distant markets under all conditions of weather and reach the consumer in a perfectly sweet condition. Pasteurized cream has been successfully shipped from Wisconsin to Maine and California and intermediate points with perfect success.

Perhaps the chief objection that can be urged against this method is the fact that after being heated to 155 deg. F. the cream never seems quite as thick as before, but this is an objection that has little weight when the true cause is known. The taste and appearance, aside from thinness, is like that of fresh cream.

To pasteurize cream it is only necessary to quickly warm it to 155 F., allow it to remain at this temperature for ten minutes and then cool it as quickly as possible. To do this rapidly on a commercial scale requires specially devised apparatus, several forms of which are already on the market. It will be seen that this method involves slightly more trouble and expense than that of preserving with chemicals, but it seems to us that it is the only practical method that is not open to very serious objections and it renders possible a large and permanent extension of what is already a considerable business in this State, and it will without doubt pay the dealers in this commodity to look well into the advantages of this method over any other at their command.

It may not be out of place in this connection to state that the Maine Experiment Station has ordered a pasteurizing apparatus of an approved pattern, which can be seen here a little later by those interested in the cream trade. We intend to carefully investigate the effectiveness of the apparatus and, if it meets with our expectations, we shall be inclined to urge upon the creamery men of the State the advisability of the pasteurizing method of preserving cream in place of the more expensive or otherwise objectionable methods that have formerly been used.